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09/729,336	12/01/2000	Arnold P. Neukermans	2149A	6278

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EXAMINER
STAHL, MICHAEL J

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2874	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/729,336	Applicant(s) NEUKERMANS ET AL.	
	Examiner Mike Stahl	Art Unit 2874	

-- The MAILING DATE of this communication appears on the cover sheet with the c rrespondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 December 2000 and 14 April 2001* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *21-78* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *67-78* is/are allowed.

6)☒ Claim(s) *21-23,26-30,33-36,39-46,54,56,59,60 and 62-64* is/are rejected.

7)☒ Claim(s) *24,25,31,32,37,38,47-53,55,57,58,61,65 and 66* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 December 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *8,9* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Preliminary Amendments

The preliminary amendments submitted 12/1/00 and 4/14/01 have been entered. Claims 1-20 were canceled. Newly added claims 21-78 are pending.

Information Disclosure Statement

The references submitted 12/1/2000 and 5/17/2002 have been considered. Initialed copies of form PTO-1449 are attached.

Comment

Claims 21 and 76 recite collimator receptacles but refer to receiving and fixing ends of optical fibers. There is no recitation of receiving or fixing of the collimators, only juxtaposition of the collimators (lenses) with the fixed fiber ends. Applicant should verify whether "collimator receptacles" should instead be "optical fiber receptacles". Note that the claims of US 6445844, which issued on the parent application, make a distinction between "collimator receptacles" and "optical fiber receptacles".

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 21-23, 26, 28-30, 33, 56, and 59 are rejected under 35 U.S.C. 102(e) as being anticipated by Solgaard et al. (US 6097859).

Solgaard discloses fiber optic switching module (fig. 1) comprising a first and a second group of fibers **14a-c** and **24a-c**. It is considered inherent that these fibers are held in receptacles of some form. There are lenses **26** and **32** associated with individual fibers and each group. The module further includes a light beam deflector assembly **18** (figs. 2 and 3) comprising a substrate, and a plurality of reflective beam deflectors **46** each of which is associated with a lens, positioned to intercept a beam from its associated lens, and energizable by drive signals (col. 6 lines 62-64) so that it deflects a beam to another selected beam deflector which also meets conditions A-C of claim 21. As shown in fig. 2, light is deflected from any one of the deflectors **46a-c** to any one of deflectors **46d-f**. Each path between a selected pair of fibers from the first and second groups involves a sequential reflection from a corresponding pair of deflectors **46**. Thus the Solgaard arrangement meets the limitations of claim 21.

As to claim 22, the substrate in the deflector arrays is formed form an insulating material.

Deflection is effected by electrostatic forces (col. 6 lines 62-64) as required by claim 23.

As to claim 26, the beam deflectors are organized as a group.

As to claim 28, Solgaard discloses a stack of beam deflector assemblies **18a-c**. In a stacked arrangement an edge of each assembly (which is free of deflectors) is juxtaposed with an edge of an underlying or overlying assembly.

As to claim 29, since Solgaard does not teach that the operation of each assembly **18** depends on the position of an adjacent assembly, it is assumed that adjacent assemblies

themselves could be offset, which in turn would cause an offset in the deflectors of the respective assemblies.

As to claim 30, the beam deflectors may be arranged as a rectangular group (such as **46a-c** in fig. 3). Each deflector is supported by hinges **50a-b** for rotation about an axis that is parallel to an axis (in this case the minor axis) of the rectangular group.

As to claim 33, the substrate may be made from polysilicon (col. 4 lines 28-36) or silicon (col. 7 lines 48-49).

As to claim 56, the light beams impinge obliquely on the deflectors (see fig. 2).

As to claim 59, the assembly **18c** is depicted in fig. 1 as overlapping assembly **18b**, while **18b** overlaps **18a**.

Claims 21, 40, 46, 54, and 62-64 are rejected under 35 U.S.C. 102(e) as being anticipated by Laor (US 6097859).

Laor discloses a fiber optic switching module comprising a first and a second group of receptacles **140** which receive and fix optical fibers **110**. Lenses **92** are juxtaposed with the ends of associated fibers. See figs. 20-22 and col. 19 lines 1-14. A beam deflector assembly is positioned along the optical path between a pair of lenses **92** (see also fig. 19). The assembly includes a substrate, which in this case is regarded as the tray **140** itself (fig. 22), and a plurality of light beam deflectors **98** each being associated with one of the lenses, positioned to intercept the collimated beam from that lens, and controlled by drive signals. Each deflector deflect the beam to a substantially similar deflector belonging to the other group of trays. Accordingly Laor anticipates claim 21.

As to claim 40, the beam deflectors are monolithically fabricated from silicon (col. 17 lines 44-63; fig. 25).

As to claims 46 and 62, the deflectors include an outer frame **150**, first inwardly projecting torsional hinges **158**, an inner frame **156** which rotates about the axis **160**, second inwardly projecting hinges **152**, and a central mirror plate **132** which rotates about an axis **154** which is not parallel to axis **160**. Claims 63 and 64 are satisfied by the arrangement shown in fig. 22

As to claim 54, Laor discloses sensors **90** which are used for targeting and alignment of the beam deflectors. Each beam deflector **98** is associated with one sensor **90**. Since the sensors measure alignment of the deflectors, they detect the orientation of the deflectors at least indirectly.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 27, 34-36, 39-45, and 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Solgaard et al. (cited above).

As to claim 27, Solgaard does not describe whether the width of the substrate exceeds the width of the group of beam deflectors. However, it would have been obvious to a skilled person to make these widths substantially equal in order to avoid waste of substrate material.

Regarding claims 34 and 39, Solgaard does not disclose the use of conductive vias to provide electrical connections to the deflectors. Such vias are well known in the art. A skilled person would have found it obvious to use vias in the Solgaard device so that electrical connections and traces could be placed on the side of the substrate opposite the deflectors, thereby leaving more space for deflectors on the deflector side.

As to claim 35, integrated circuits are not specifically mentioned in Solgaard. However, it would have been obvious to a person of ordinary skill in the art to include integrated circuits on the substrate of the deflector assembly since this would save space and afford simpler electrical connection as compared to non-integrated circuitry.

As to claim 36, the substrate includes electrodes for electrostatic deflection but amplifiers are not described. The use of amplifiers to increase a drive signal sufficiently for operating a device is old; the principle is used in loudspeakers, motor controllers, hydraulic jacks, etc. It would have been obvious to a skilled worker to include amplifiers since this would permit the drive signal generator to operate at relatively low voltage (as opposed to having a multitude of connections all carrying the same high voltage needed for deflection).

Regarding claims 40 and 41 it is unclear whether the deflectors in fig. 3 are made of single-crystal silicon. It would have been obvious to a skilled person to fabricate the deflector array from one single-crystal silicon wafer since silicon micromachining techniques are highly developed and since single-crystal silicon has well-defined crystallographic planes which afford known benefits.

As to claims 42-44, the same assertion is made here as was made for claims 27-29 (respectively) above.

As to claim 45, it would have been obvious to a person having ordinary skill in the art to group the beam deflectors in any convenient manner.

As to claim 60, Solgaard does not specifically mention ribbon cables. However, it would have been obvious to a skilled worker to use a ribbon cable for conducting the drive signals since this would facilitate electrical connection to the deflector assembly substrates as compared with a mass of loose wires or with other types of cables.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Allowable Subject Matter

Claims 67-78 are allowed.

Claims 24-25, 31-32, 37-38, 47-53, 55, 57-58, 61, and 65-66 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

As to claims 24 and 25, neither Solgaard nor Laor discloses or suggests the recited elements for preventing contact of the electrodes with the beam deflectors. Solgaard specifically

teaches that the deflectors can be deflected into shorting contact with landing electrodes on the substrate.

As to claims 31 and 32, neither of the applied references teaches or suggests an arrangement which clearly satisfies the requirements of these claims in combination with all the feature of their parent claims.

As to claims 37-38 and 55, neither Solgaard nor Laor teaches or suggests the recited means for detecting the orientation of the deflectors.

As to claims 47-48 and 65-66, Laor discloses a central mirror plate **132** which is substantially square (fig. 25). The reference offers no motivation to configure the mirror plate to have sides of unequal length.

As to claims 49-53, the applied references do not disclose or suggest the recited device and handle layers of a silicon wafer. There is no teaching in Solgaard or Laor which specifically constrains the deflectors to being made from a silicon wafer having these distinct types of layers.

As to claims 57 and 58, the deflectors **46** in Solgaard or **132** in Laor appear to be square. There is no teaching or suggestion to provide these deflectors with the recited profile.

As to claim 61, the applied references fail to describe or suggest all the elements of the recited arrangement.

As to claims 67-75, none of the references of record disclose or suggest a beam deflector assembly which has all the recited features. The most pertinent references of record are US 5629790, which has common inventors and discloses a relevant beam deflector structure but

does not disclose flip-chip mounting of the structure; and US 6337760 (fig. 8) and US 6388789 (figs. 4A-4C) which disclose flip-chip mounted beam deflector structures but are not available as prior art.

As to claims 76-78, Solgaard and Laor teach most of the recited elements as noted in the above rejections of claim 21, but do not teach or suggest orientation sensors included within the respective beam deflectors. The sensors in Laor are entirely separate from the deflectors.

Conclusion

The references made of record and not relied upon is considered pertinent to applicant's disclosure. US 6347167 discloses a relevant optical switch but is not available as prior art. US 5914801 discloses a microelectromechanical beam deflector.

Any inquiry concerning this communication should be directed to Mike Stahl at (703) 305-1520. Official communications eligible for submission by facsimile may be faxed to (703) 308-7724 or (703) 308-7722. Inquiries of a general or clerical nature (e.g., a request for a missing form or paper, etc.) should be directed to the Technology Center 2800 receptionist at (703) 308-0956 or to the technical support staff supervisor at (703) 308-3072.

MJS

Michael J. Stahl
Patent Examiner
Art Unit 2874

February 16, 2003